WE CLAIM:

Sub B2

~~1. A system for inspecting a specimen, comprising:~~

~~a light generating device;~~

~~an optical element arrangement for receiving light from said light generating device and imparting light toward said specimen and receiving a retro beam from said specimen;~~

~~a retro beam diversion element for diverting the retro beam from said optical element arrangement; and~~

~~a sensing device for receiving and sensing retro beam position upon diversion from said optical element arrangement, said sensing device having dimensions and an orientation to favorably receive said retro beam based on a predetermined expected diversion thereof.~~

2. The system of claim 1, wherein said optical element arrangement comprises an optical isolator.

3. The system of claim 2, wherein said system further comprises:

a birefringent prism;

a lensing arrangement for receiving light energy from said birefringent prism;

at least one mirror, wherein one mirror receives light energy from said optical isolator; and

a half wave plate for receiving light energy from said one mirror and transmitting light energy to said birefringent prism.

4. The system of claim 2, wherein said optical element arrangement further comprises a dark field collection arrangement.

5. The system of claim 1, wherein said optical element arrangement comprises an optical isolator, and said retro beam

diversion element diverts light energy received from said optical isolator.

6. The system of claim 1, wherein said retro beam diversion element comprises a beamsplitter.

7. The system of claim 1, wherein said specimen comprises a surface, and wherein said sensing device senses diversion of said retro beam from an expected value and said system further comprises means for mapping a two dimensional x-y representation of the specimen surface based on signals received from said sensing device.

8. The system of claim 1, wherein said optical element arrangement comprises a Nomarski Differential Interference Contrast sensor.

9. The system of claim 8, wherein said Nomarski Differential Interference Contrast sensor divides light received in a single beam into a plurality of beams; and

wherein said optical element arrangement imparts a plurality of beams onto said specimen.

10. The system of claim 9, wherein the plurality of beams comprises two beams and wherein the system scans the specimen in a direction substantially parallel to a line joining said two beams.

11. The system of claim 1, wherein said sensing device comprises a one dimensional detector array.

12. The system of claim 11, wherein said one dimensional detector array comprises one from the group including a CCD, a position sensitive detector, and a linear diode array.

13. The system of claim 1, wherein said sensing device comprises:

a plurality of detector elements having exposed ends and predetermined spacing between said detector elements;

a plurality of electrical connections affixed to said exposed ends of said detector elements; and

a plurality of preamplifiers, wherein each detector element has a preamplifier associated therewith.

14. The system of claim 13, further comprising:

a first plurality of weighting elements, each weighting element having a first predetermined weight associated therewith and electrically connected to a preamplifier;

a second plurality of weighting elements, said second plurality of weighting elements having a second predetermined weight associated therewith and electrically connected to a preamplifier wherein said first predetermined weight differs from said second predetermined weight; and

a plurality of summing amplifiers for receiving and combining weighted signals from predetermined weighting elements;

whereby each preamplifier is electrically connected to two weighting elements.

15. The system of claim 14, further comprising:

programmable array logic for receiving signals from said summing amplifiers and predetermined power thresholds and selecting signals to be transmitted based on said predetermined power thresholds; and

a multiplexer for receiving output selection signals from said programmable array logic and transmitting appropriate signals from said summing amplifiers.

16. The system of claim 1, wherein said light generating device comprises a laser.

17. The system of claim 1, wherein light is imparted toward said specimen and said retro beam is received in a substantially normal orientation with respect to said specimen.

18. A detector array for detecting light energy, said light energy forming a beam having a predetermined diameter, comprising:

a plurality of elements having exposed ends and predetermined spacing between said elements;

a plurality of electrical connections affixed to said exposed ends of said elements; and

wherein said elements have width less than one third the beam diameter.

19. The detector array of claim 18, further comprising:

a first plurality of weighting elements, each weighting element having a first predetermined weight associated therewith and electrically connected to said preamplifier;

a second plurality of weighting elements, said second plurality of weighting elements having a second predetermined weight associated therewith and is electrically connected to said preamplifier, wherein said first predetermined weight differs from said second predetermined weight; and

a summing amplifier for receiving signals from selected ones of said first plurality of elements and said second plurality of elements.

20. The detector array of claim 19, wherein each preamplifier is electrically connected to two weighting elements.

21. The detector array of claim 18, wherein movement of said beam is sensed by said detector array, and said movement alters electrical signals transmitted from selected elements of said detector array.

22. The detector array of claim 21, wherein movement of said beam causes altered transmission of signals to a weighting and summing arrangement.

23. The method of claim 18, further comprising:

a plurality of preamplifiers, wherein each linear diode element has a preamplifier associated therewith.

Sub B3

24. A system for detecting contours on a specimen surface, comprising:

means for applying light energy to said specimen surface; and

means for detecting surface variations having relative surface height variations of less than approximately 1000 nanometers and surface contours over areas larger than particles and scratches.

25. The system of claim 24, wherein said detecting means comprise optical relaying means for transmitting light energy received from said light energy applying means to said specimen surface and receiving a retro beam deflected therefrom.

26. The system of claim 24, further comprising:

an optical diversion element; and

sensing means for detecting movement of said retro beam;

wherein said sensing means receive the retro beam diverted by said optical diversion element.

27. The system of claim 26, wherein said sensing means comprise a linear array of sensors.

B

28. The system of claim ~~25~~ 24, further comprising:

sensing means; and

weighting and summing means for weighting and summing information received from said sensing means.

29. The system of claim 28, further comprising programmable array logic and a multiplexer, wherein said programmable array logic determines signals based on predetermined threshold exceedance and initiates any determined signal via said multiplexer.

30. The system of claim 24, wherein said detecting means have the ability to detect surface variations having relative surface height variations of less than approximately 1000 nanometers and greater than approximately 1.0 nanometer.

31. The system of claim 30, wherein said detecting means have the ability to detect surface variations having relative surface height variations of less than approximately 1000 nanometers and greater than approximately 0.1 nanometer.

32. A system for weighting data received from an electrical sensing array, said electrical sensing array including a plurality of elements, comprising:

a plurality of preamplifiers each electrically connected to one of said plurality of elements;

a first plurality of weighting elements, each weighting element having a first predetermined weight associated therewith and electrically connected to said preamplifier;

a second plurality of weighting elements, said second plurality of weighting elements having a second predetermined

weight associated therewith and is electrically connected to said preamplifier, wherein said first predetermined weight differs from said second predetermined weight; and

at least one summing amplifier;

whereby each preamplifier is electrically connected to two weighting elements.

33. The system of claim 32, wherein each summing amplifier receives and combines weighted signals from predetermined weighting elements.

34. The system of claim 32, wherein:

said first plurality of weighting elements is associated into at least one group;

said second plurality of weighting elements is associated into at least one group; and

each summing amplifier receives information from a group.

35. The system of claim 32, further comprising:

programmable array logic for receiving signals from said summing amplifiers and predetermined power thresholds and determining those signals to transmit based thereon.

36. The system of claim 35, further comprising:

a multiplexer for receiving output selection signals from said programmable array logic and transmitting appropriate signals from said summing amplifiers.

Sub B4

~~37~~. A method for inspecting a specimen, comprising the steps of:

imparting light energy toward an arrangement of optical elements;

providing light energy to said specimen via an arrangement of optical elements, thereby creating a retro beam reflected from said specimen;

passing said retro beam back through said arrangement of optical elements; and

providing said retro beam to a sensing device, said retro beam having an expected diversion in a substantially predetermined direction and said sensing device being substantially linearly dimensioned and oriented to receive diversions of said retro beam in said substantially predetermined direction;

wherein said sensing device senses movement of the retro beam corresponding to anomalies on said specimen.

38. The method of claim 37, wherein said optical element arrangement comprises:

a birefringent prism; and

a lensing arrangement, said lensing arrangement comprising a plurality of optical lenses.

39. The method of claim 38, wherein said optical arrangement further comprises:

an optical isolator;

a half wave plate; and

at least one mirror.

40. The method of claim 37, wherein said optical element arrangement comprises an optical isolator, and said retro beam providing step diverts light energy received from said optical isolator.

41. The method of claim 37, wherein said retro beam providing step comprises diverting the retro beam via a beamsplitter.

42. The method of claim 37, wherein said optical element arrangement comprises a bright field scanning Nomarski Differential Interference Contrast sensor.

43. The method of claim 42, wherein said bright field scanning Nomarski Differential Interference Contrast sensor measures deviation along a direction substantially perpendicular to an optical lever.

44. The method of claim 37, wherein said sensing device comprises:

a plurality of detector elements having exposed ends and predetermined spacing between said elements;

a plurality of electrical connections affixed to said exposed ends of said detector elements; and

a plurality of preamplifiers, wherein each element has a preamplifier associated therewith.

45. The method of claim 37, wherein said optical element arrangement comprises a bright field scanning Nomarski Differential Interference Contrast sensor.

46. The method of claim 45, wherein bright field scanning Nomarski Differential Interference Contrast sensor measures deviation along a direction substantially perpendicular to the orientation of beams created thereby.

47. The method of claim 37, wherein said light energy is provided to said specimen in a substantially normal orientation.

Sub B5

~~48.~~ A method for detecting contours on a specimen surface, comprising:

applying light energy to said specimen surface; and

detecting surface variations having relative surface height variations of less than approximately 1000 nanometers and surface contours over areas larger than particles and scratches.

49. The method of claim 48, wherein said detecting step comprises transmitting light energy received from said light energy applying step to said specimen surface and receiving a retro beam deflected therefrom.

RAR rule 75(f)

50
~~49~~. The method of claim 48, further comprising the steps of:

optically diverting light energy after said applying step; and

detecting movement of said retro beam by receiving the retro beam diverted by said optical diversion step.

51. The method of claim 48, further comprising the steps of weighting and summing information received from said detecting step.

52. A method for inspecting the surface of a specimen, comprising the steps of:

(a) providing at least three linearly arranged elements having exposed ends and predetermined spacing therebetween; and

(b) imparting a substantially Gaussian light beam onto said plurality of linearly arranged elements, wherein said beam has the expected ability to move in a predetermined direction substantially collinear with said plurality of linearly arranged elements;

wherein said beam spans at least three of said linearly arranged elements.

53. The method of claim 52, further comprising the steps of:

(c) imparting light energy toward an arrangement of optical elements;

(d) providing light energy to a specimen via an optical element arrangement, thereby creating a retro beam reflected from said specimen;

(e) passing said retro beam back through said arrangement of optical elements, thereby creating said substantially gaussian light beam;

wherein steps (c), (d), and (e) occur prior to step (b).

54. The method of claim 53, wherein said optical element arrangement comprises:

a birefringent prism; and

a lensing arrangement, said lensing arrangement comprising a plurality of optical lenses.

55. The method of claim 54, wherein said optical element arrangement further comprises:

an optical isolator;

a half wave plate; and

at least one mirror.

56. The method of claim 53, wherein said optical element arrangement comprises a bright field scanning Nomarski Differential Interference Contrast sensor.

57. The method of claim 56, wherein said bright field scanning Nomarski Differential Interference Contrast sensor splits said beam into two beams, and wherein said providing step comprises scanning said two beams of light over said specimen at a substantially orthogonal angle to an optical lever.

21252839

58. The method of claim 52, wherein said linearly arranged elements further comprise:

a plurality of electrical connections affixed to said exposed ends of said elements; and

a plurality of preamplifiers, wherein each linear diode element has a preamplifier associated therewith.

59. A method of measuring surface topography of an object, comprising the steps of:

measuring said surface topography along a first axis using a first optical technique; and

simultaneously measuring said surface topography along a second axis at an angle offset from said first axis using a second optical technique different from said first technique while maintaining relative motion between said object and a system for performing said first and second measurements.

60. The method of claim 59, wherein said first axis is orthogonal from said second axis.

Add B6

21252839